The Impact of Health Expenditures on Economic Growth in Bangladesh

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Abstract

'The groundwork of all happiness is good health' – Leigh Hunt. Good health would require better expenses on it, but how about at least some expenses on health impacting economic growth in a developing country like Bangladesh. This paper tries to analyze the relation (correlation) between healthcare expense and GDP per capita, worth the expense or futile. Findings from Ordinary Least Square (OLS) regression suggest healthcare expenditure does raise the economic growth, controlling for other variables such as maternal mortality rate, trade GDP ratio, population & etc. The understanding also suggests that GDP per capita has a positive correlation with the healthcare expenditure. Despite being a chance of unstable or fluid impact due to a smaller observation.

Keywords: Health expenditure, GDP per capita, Economic growth, Correlation, Regression, Impact of health expenditure, Ordinary Least Square, Bangladesh

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1. Introduction

Economists are dealing with the term economic growth of a nation since the late eighteenth or early nineteenth century. Economic growth is a rise in the ability of an economy to deliver goods and services from time to time. It can be calculated in minor or major terms. Usually economic growth is determined in terms of gross national Product (GNP) or gross domestic product (GDP) or GDP per capita.

Paul Romer's view on economic growth is more like rearranging resources in more useful ways. Metaphorically ingredients are mixed according to the recipe, cooking in the economy generates unwanted impacts. If economic growth could be maximized by doing more of similar cooking, sooner or later there will be a shortage of raw materials and endure from intolerable amounts of trash and mess.

However, there are many indicators of course which causes the economy to rise or fall. The one this paper is going to focus on is 'health expenditure' and how it impacts the 'economic growth' in Bangladesh taking other indicators as well to the model simultaneously. The main aim for this paper is to demonstrate how a single factor can boost or impede the economy especially in Bangladesh & how the government can react to the changes that may take place. However, this paper will help to forecast one step further, yet this analysis is not an all-in-one solution package. In 2019, expenditure on health was about 2.41% (forecasted) of gross domestic product, where America with the highest having 17.0% and Venezuela with the lowest barely reaching 1.0%. Dealing with growth directs us to something essential that any nation must look upon because economy is the very base of its nation. There are several growth theories economists have come up with such as 'The Malthusian theory', 'Classical growth theory', 'Endogenous growth theory', 'Unified growth theory' and more.

Now if we investigate the 'GDP growth rate (%) with time (2000-2019)' line chart of Bangladesh,
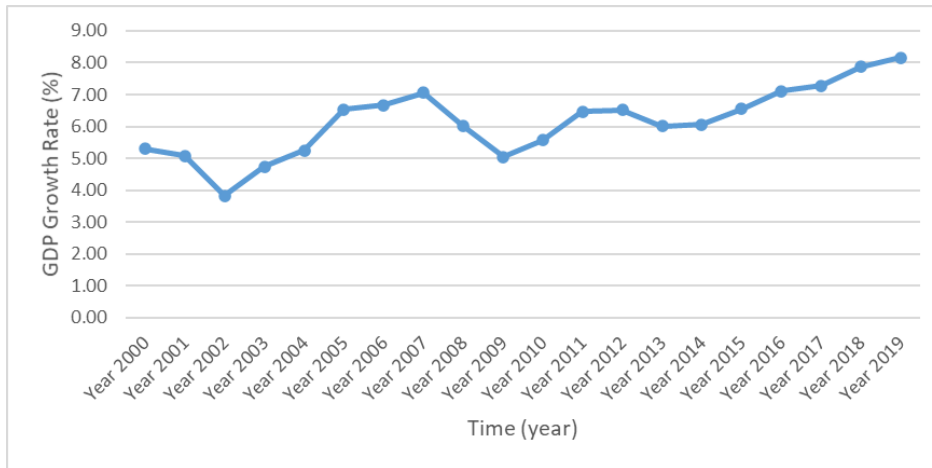

Figure 1: GDP growth rate (%) with Time

having lowest 3.83% in year 2002 and highest 8.45% in the recent year 2019 has been increasing with a positive slope since breakeven of 2013. This positive slope indicates the increase in return to scale and the very nation is developing at a better rate than before. On the other hand if we analyze the 'health expenditure / GDP (%) with
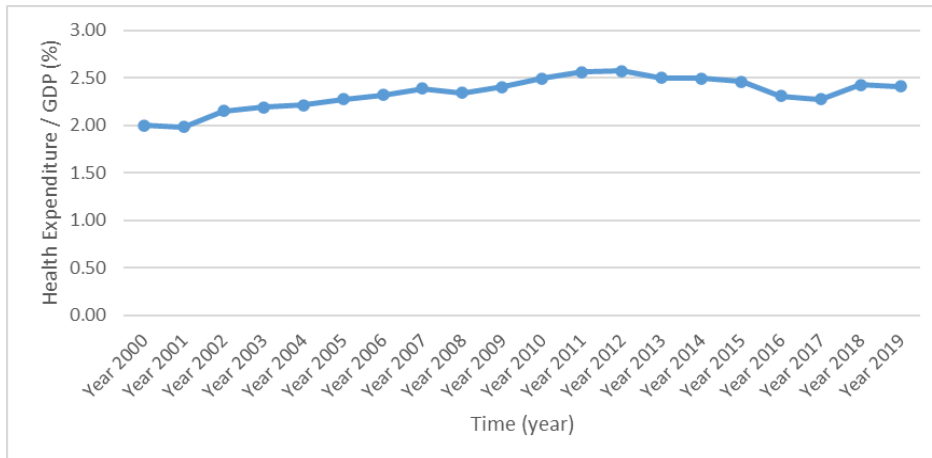

Figure 2: Health Expenditure / GDP (%) with Time

time (2000-2019)' line chart of the very same country, apart from year 2001 the health expenditure has not fallen under 2.0% with a maximum of 2.57% and minimum of 1.99%. But this does not seem to have a constant positive trend which sadly is not great news for its people if the correlation among economic growth and health expenditure is positive which is yet to be examined in the further part of the paper.

The very first part in the paper announces the main variables (health expenditure & economic growth) and defines them with proper graphical figures. Secondly the paper reviews previous literatures and analyzes those output. Thirdly, it talks more about the method, how the model is

put to work, defines variables including summary table. Fourthly, results are displayed with proper interpretation having tables and graphs. Finally, the paper ends with a conclusion where it states regarding the scopes and boundaries.

2. Literature review

Healthcare expenditure can follow in better facilities of health opportunities which later can reinforce human capital and expand the efficiency through adding to economic implementation. The following reviews of literature talks more about the problems and solutions and the tools that can be applied for some time series data on several countries.

Variables that correlate each other can last out for decades or even for some cycles. As far back in 2012 Rengin AK (2012) stated that health expenditure as one essential component of human capital. Human capital can be expanded if there is an increase in health expenditures in case of quality and quantity both. The author found many theoretical and empirical studies indicating that increase in human capital affects economic growth positively. In the article, the presence of a long-term causation link between health expenditures, economic growth, and life expectancy at birth series was investigated for the Turkish economy. The author was left with the fact that, rather than a short-term relationship between the series, there is a long-term relationship between health expenditures and economic growth.

Another issue in health systems is that what defines the resources a country allocates to medical care is far more less compared to developed countries. M Mohsen et al (2012) found that the portion of the health expenditures of GDP in developed countries is repeatedly more than developing countries, therefore as the intensity of development boosts health expenditures increase too. The author took a sample of 13 Middle East & North Africa (MENA) countries using data for the period 1995-2005 and found that, co-integration between the health expenditure and GDP

based on the panel co-integration analysis varies. This study also forecasts panel unit root tests results which suggest that both health expenditure and GDP are non-stationary as well. Despite the fact, the findings indicate that health expenditure and GDP are related to each other. The author assumed that the share of health expenditures to GDP decreases with GDP. Lastly, he infers that health care is not a luxury good in MENA countries. M Mohsen et al's findings were replicated in some point of correlation by Elmi ZM & Sadeghi S (2012) in the very same year, they examined the causality and co-integration relationships between economic growth and health care expenditures in developing countries during 1990-2009. Authors focused on panel cointegration and causality in Vector Error Correction Model (VECM) structure. In this article the results disclosed that there is a short-run connection from GDP to health care spending, but nothing in case of health spending to economic growth. Similarly, there is a mutual connection and long-run relationship between economic growth and health spending. They also observed from their outcomes that income is an important factor across developing countries and growth of health care expenditure very much in the long-run, also the health-led growth hypothesis in developing countries is established.

In case of a single county having time series data, Raza K, Majeed S & Islam M (2016) have investigated the concerns of health sector in Pakistan and features the important linkage between health indicators and economic growth in the year 2016. They used ordinary least square (OLS) method and Granger Causality technique on time series data of Pakistan from 1980-2012. Health expenditures, fertility rate, life expectancy, and infant mortality rate have been used as health indicators. The goal of this study is to improve issues in health sectors that directly or indirectly affect economic growth of Pakistan. According to this article the results showed that health indicators have significantly inspired the per capita GDP. Health expenditures have constructive

but irrelevant impact on economic growth but again there is a negative relationship of infant mortality rate, population per bed on economic growth. Authors were able to find that by increasing the health facilities which will enhance the viable level of economic growth.

Wang F (2015) found out the optimal amount a nation should spend on health from its gross domestic product, but this may not be true for another nation. The author mainly worked with Organization for Economic Co-operation and Development (OECD) countries and found that if there is a spend of 7.55%, optimal level can be achieved and therefore it may finally lead to better economic performance, the method used was generalized method of moments (GMM).

Therefore, some authors were able to demonstrate the outcomes directly and some indirectly depending on the availability of factors such as data, tools, hypotheses and so on. They also tried to fill the gaps if there were any. Most works that were done previously might not be like what this paper will forecast due to time differences, technological changes, even this is a whole different region and different data set including the recent years.

3. Methodology

Health expenditure in a developed country has a whole different picture in case of a healthy ratio of input to its output if compared to a developing country such as Bangladesh as of 2020. The focus has remained on Bangladesh's health expenditures and its economic growth rate, like what impact 'health expenditure' of a country can bring to that very country's economic growth. Here economic growth can be replicated by the term GDP per capita or economic performance. Now the performance can be positive or negative.

This paper tends to examine:

(1) can health expenditure influence (coefficient) economics growth rate &

(2) how health expenditure is impacting (correlation) the economics growth rate if (1) is yes.

Analytical Framework

The very initial work can be shown via a function as follows:

$$y = f(h, X)$$

where (y) is our dependent variable which is per capita GDP, (h) is our explanatory variables which are basically the factors that may affect the (y) including healthcare expenditure, and finally (X) which are independent variables which may influence the model. We can add them up into the error term in the model.

Model for OLS estimation

$$\log y = \beta_0 + \beta_1 h_1 + \beta_2 h_2 + .. + \beta_n h_n + \varepsilon_X$$

Where log y represents per capita GDP, β_0 represents the intercept, β's represent coefficient for each explanatory variables, h's represent the factors affecting the GDP (explanatory variables) & ε_X represents the error term including other independent variables which are not present into the model but may influence the model.

About the Data

The perks of working with a single region has few data to work with because it is less time consuming, but again more observation can lead into more significant output. However, the dependent and explanatory variables are observed over the period from 2000 to 2019 which are taken from a secondary data source called Macrotrends (established in 2010). The following variables are examined: GDP Growth Rate (%); Healthcare Expenditure (%); Per Capita GDP (US $); Inflation Rate (%); Population (M); Maternal Mortality Rate per 100k births; Birth Rate per 1k people; and the Trade GDP Ratio (%).

Forecasting Data

Due to some missing data (i.e. Healthcare Expenditure, data for the last two years were missing), extrapolation was done via Excel TREND formula to forecast the missing year data as follows.

TREND formula for this specific case =TREND(X's,Y's,Y's,TRUE)

Y	X
2006	2.322
2007	2.3877
2008	2.346
2009	2.4034
2010	2.4959
2011	2.5659
2012	2.573
2013	2.5033
2014	2.496
2015	2.4631
2016	2.3118
2017	2.2742
2018	=TREND(
2019	2.40905

Figure 3: Data Forecasting Trend

Variables & Summary table

Table 1: Variables with description

Name	Description
GDP_GR	GDP Growth Rate (%)
Hc_Exp	Healthcare Expenditure (%)
Hc_Exp_2	Healthcare Expenditure Squared
GDP_PC	GDP Per Capita (US $)
Log_GDP_PC	Log of GDP Per Capita
Inflation_R	Inflation Rate (%)
Population_M	Population in million
Maternal_M_R	Maternal Mortality Rate per 100k births
Birth_R	Birth Rate per 1k people
Trade_GDP_Ratio	Trade GDP Ratio (%)

- Hc_Exp_2 is Healthcare Expenditure Squared value; this was generated in Stata with a simple command as follows : gen Hc_Exp_2=Hc_Exp^2

- Log_GDP_PC is Log of GDP Per Capita value; this was generated in Stata with a simple command as follows : gen Log_GDP_PC=log(GDP_PC)

Table 2: Summary Statistics of the Variables

Variable	Mean	Std. Dev.	Min	Max
GDP_GR	6.16	1.09	3.83	8.15
Hc_Exp	2.34	0.17	1.99	2.57
Hc_Exp_2	5.50	0.77	3.95	6.62
GDP_PC	873.35	461.73	413.08	1855.74
Log_GDP_PC	6.65	0.51	6.02	7.53
Inflation_R	6.34	2.24	2.01	11.40
Population_M	146.43	10.72	127.70	163.00
Maternal_M_R	279.85	90.48	152.00	434.00
Birth_R	22.23	3.11	18.04	27.85
Trade_GDP_Ratio	37.73	6.46	26.86	48.11

Here the summary statistics shows the following:

Data for health expenditure ranges from 1.99 to 8.15, with a mean of 6.16 and standard deviation

of 1.09. For GDP per capita, we have a wide range between 413.08 and 1855.74. Average GDP

per capita for the dataset is 873.35 with standard deviation of 461.73. Also, for Log GDP per capita

it ranges from 6.02 to 7.53 with a mean of 6.65 and standard deviation of 0.51.

4. Data analysis & Results

20 observations at 5% significance level ($\alpha = 0.05$)

Table 3: Regression1 (R1)

Variable	Coefficient
Hc_Exp	13.33
	(16.37658)
Hc_Exp_2	-2.57
	(3.689135)
Trade_GDP_Ratio	0.008
	(0 .0338662)
Y- intercept: -10.71	
(18.64373)	

Table 4: Regression2 (R2)

Variable	Coefficient
Hc_Exp	11.62
	(14.30937)
Hc_Exp_2	-2.14
	(3.124603)
Y- intercept: -8.77	
(16.31968)	

Table 5: Regression3 (R3)

Variable	Coefficient
Hc_Exp	1.83
	(0 .5667041)
Y- intercept: 2.36	
	(1.329444)

Table 6: Correlation1 (C1)

Variable	Correlation
Hc_Exp	0.6056
Hc_Exp_2	0.5999
Population_M	0.9792
Birth_R	-0.9606
Maternal_M_R	-0.9615
Inflation_R	0.1784
Trade_GDP_Ratio	0.5044

Regression1 (R1) & Regression2 (R2) both has few common highlights such as each regressors are insignificant (P-value > 0.05) despite the fact that Hc_Exp (health expenditure) has positive (coefficient) effect on economic growth (Log_GDP_PC). Also, there is a similarity on how Hc_Exp_2 (healthcare expenditure squared) is reacting, healthcare expenditure squared is nothing but an expenditure which is higher than Hc_Exp. This means the government cannot just keep increasing the amount of health expenditure, if Hc_Exp < Hc_Exp_2 then there would not be an increase in economic growth, this is what the negative sign tells us. Another similarity is that both Y-intercepts are negative, this means even if there is no indicator, yet there will be a negative value to the economic growth. In R1 it is also found that trade GDP ratio does have a positive impact on

economic growth. Both R1 & R2 have insignificant regressors due to the lesser number observations available.

However, Regression3 (R3) is what we were looking for all these times. R3 estimates only the impact of health expenditure on economic growth where the regressor is highly significant with P-value=0.005 which is lower than 5% significant level.

This is how the model looks like :

$$\widehat{Log\_GDP\_PC} = 2.36 + 1.83\ (\widehat{Hc\_Exp})$$

If we increase 1 unit in healthcare expenditure, there will be a positive 1.83% increase in the economic growth (controlling for other variables here). There is a Y-intercept of 2.36 which is

basically saying even if there is no indicator in the model, economic growth is still a positive 2.36 unit. The scattered graph is also showing a positive slope until a point where it is not wise to spend more in health because of a breakeven point where the growth falls suddenly from a high point, as seen on R1 & R2 where healthcare expenditure square was negative.
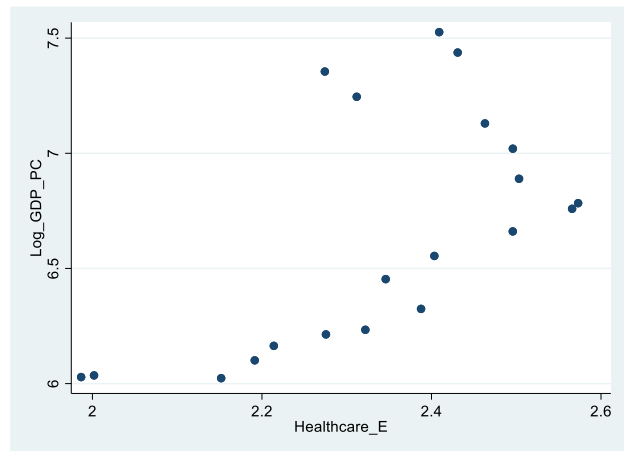

Figure 4: Scatter graph (Health Expenditure & Log GDP per capita)

Correlation1 (C1) is showing how much one variable is related to another. In case of our dependent variable, healthcare expenditure is around 60% correlated to it where population is 97% correlated because human capital is one indicator that highly influences the economic growth, inflation is just 17% correlated where birth rate and maternal mortality rate is negatively correlated, lastly the trade GDP ratio also influences the growth rate by 50%.
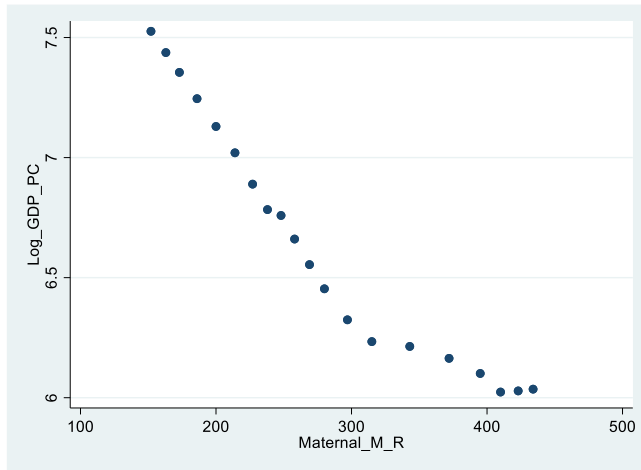
How other variables may influence economic growth.

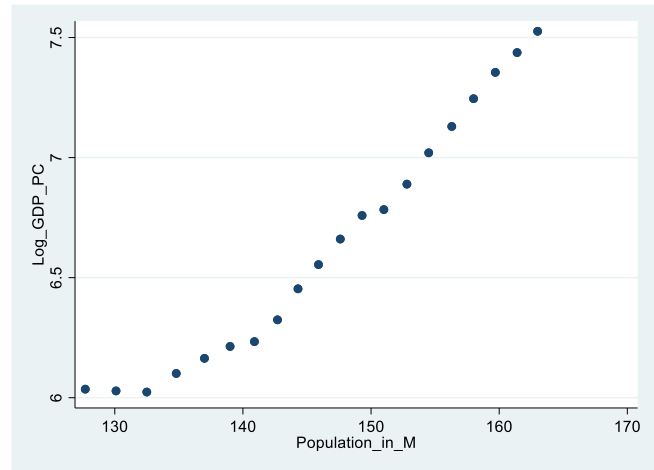**Figure 5: Scatter graph (Maternal mortality rate & Log GDP per capita)**

Figure 6: Scatter graph (Population & Log GDP per capita)

Apart from our findings we can now see how other factors can influence economic growth rate. Figure (5) tells more about how maternal mortality rate is affecting the economic growth rate, once human capital keeps decreasing the economic growth rate also keeps decreasing as shown on (5) with a negative slope. On the other hand, figure (6) is showing a positive relationship among the variables with an increasing slope, this is because if population increases, that will result in a rise of human capital and therefore end up in an increase in economic growth as well.

Limitations

Since there was a smaller number of observations (20 years), there is a high chance of getting weaker coefficient that can signify a more unstable or fluid impact. If secondary data that were collected have biasness or if manipulated by any means, that will lead to more insignificant results as seen on R1 & R2. Again, linear & multiple regression were applied to validate the impact of healthcare expenditure, there are also other approaches by which the impact can be examined that we did not investigate here.

5. Conclusion

Using secondary data from 2000 to 2019 and regression analysis, the paper targeted at uncovering the impact of health expenditure on economic growth (GDP per capita).It has been observed that GDP per capita is influenced relatively clearly and statistically the outcome is found as significant. This paper has not dive very much inside, this analysis in other words can be labeled as an outer shell. However, it is yet to find the optimal level at which Bangladesh should spend on health by taking more variables and observations avoiding secondary data if possible. Nevertheless, the result learned here would be handy to various measures such as the quality of public health, improving birth rate, lowering the maternal mortality rate and other indicators that influence economic growth.

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